

Cosmogenic Neutrinos Challenge the Cosmic Ray Proton Dip Model

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We fit the recent UHECR spectrum measurements from the Telescope Array experiment under the assumption of pure proton composition, as assumed by the proton dip model.

We present a full scan of the three main physical model parameters of UHECR-injection: source redshift evolution, injected maximal proton energy and spectral power-law index. We discuss how the result qualitatively changes compared to earlier two-parameter fits in the literature: a mild preference for a maximal energy cutoff at the sources instead of the Greisen-Zatsepin-Kuzmin (GZK) cutoff, hard injection spectra, and strong source evolution.

We show that the predicted neutrino flux exceeds the IceCube limit for any parameter combination. As a result, the proton dip model is challenged at more than 95% C.L.

This is strong evidence against the dip-model independent of mass composition measurements.

Summary

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